Electronic Version
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Claims

[c1] 1.An apparatus for providing electrical protection to a protected circuit in electrical communication with an electrical source, the apparatus comprising:
a housing;
a separable conduction path in series connection with the protected circuit;
an operating mechanism in operable communication with the separable conduction path;
a thermal element in thermal communication with the separable conduction path; and
an electronic trip unit in signal communication with the thermal element and in operable communication with the operating mechanism;
wherein the electronic trip unit is adapted to sense a voltage drop across the thermal element and to trip the operating mechanism in response to the sensed voltage drop being in excess of a first trip threshold.

[c2] 2.The apparatus of Claim 1, wherein the thermal element comprises a resistive element.

[c3] 3.The apparatus of Claim 2, wherein the resistive element comprises a bimetal.

[c4] 4.The apparatus of Claim 3, wherein the thermal element is arranged to mechanically trip the operating mechanism in response to an overcurrent condition in the protected circuit being in excess of a second trip threshold.

[c5] 5.The apparatus of Claim 3, wherein:
the first trip threshold is representative of a first current level; and
the second trip threshold is representative of a second current level that is greater than the first current level.

[c6] 6.The apparatus of Claim 5, further comprising:
a magnetic trip unit in signal communication with the separable conduction path and in operable communication with the operating mechanism;
wherein the magnetic trip unit is arranged to mechanically trip the operating mechanism in response to an overcurrent condition in the protected circuit being in excess of a third trip threshold.

[c7] 7.The apparatus of Claim 6, wherein:
the third trip threshold is representative of a third current level that is greater than the second current level.

[c8] 8.The apparatus of Claim 3, wherein:
the bimetal is adapted to conduct a first steady state electrical current having a first steady state rating and a

second steady state electrical current having a second steady state rating, the second steady state rating being two-times the first steady state rating; and
the electronic trip unit is configurable to provide an X-rating of the apparatus equal to the first steady state rating, the second steady state rating, or both steady state ratings.

[c9] 9.The apparatus of Claim 8, wherein:
the bimetal is adapted to conduct a third steady state electrical current having a third steady state rating, the third steady state rating being three-times the first steady state rating; and
the electronic trip unit is configurable to provide an X-rating of the apparatus equal to the third steady state rating.

[c10] 10.The apparatus of Claim 9, wherein:
the bimetal is adapted to conduct a fourth steady state electrical current having a fourth steady state rating, the fourth steady state rating being four-times the first steady state rating; and
the electronic trip unit is configurable to provide an X-rating of the apparatus equal to the fourth steady state rating.

[c11] 11.The apparatus of Claim 1, wherein the first trip

threshold is adjustable subsequent to the apparatus being installed in an application.

[c12] 12.The apparatus of Claim 1, wherein the electronic trip unit is adapted to receive electrical power from the line voltage of the electrical source.

[c13] 13.A method of protecting an electrical circuit in electrical communication with an electrical source, the method comprising:
sensing a voltage drop across a resistive element disposed in a separable conduction path connected in series with the electrical circuit;
in response to the sensed voltage drop, calculating a value representative of the current in the conduction path;
comparing the calculated value to a threshold value; and
in response to the calculated value being in excess of the threshold value, tripping an operating mechanism and separating the separable conduction path.

[c14] 14.The method of Claim 13, wherein the resistive element comprises a bimetal, and further comprising:
determining an ambient temperature;
wherein the calculating a value representative of the current in the conduction path further comprises compensating for that portion of the sensed voltage drop that is

a function of the ambient temperature.

[c15] 15.The method of Claim 13, wherein the threshold value is a characteristic curve that is a function of current and time.

[c16] 16.The method of Claim 13, wherein the threshold value is a characteristic curve that is a function of temperature and time.

[c17] 17.The method of Claim 13, wherein the calculated value is a function of the ambient temperature, heat generated by the current in the resistive element, and heat transfer from the conduction path.

[c18] 18.The method of Claim 17, wherein:
the calculated value is a function of the temperature of the resistive element; and
the resistive element comprises a material characteristic comprising an electrical resistivity, a temperature coefficient of resistance, a specific heat, a thermal conductivity, or any combination of material characteristics comprising at least one of the foregoing.

[c19] 19.The method of Claim 13, further comprising:
updating an accumulator with a timed update of the calculated value; and
resetting the accumulator to an initial setting in re-

sponse to a reset signal.

[c20] 20.The method of Claim 13, further comprising: associating the calculated value with at least one of a plurality of time-current characteristic curves stored in a memory prior to determining whether a trip threshold has been exceeded.